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THE PSYCHOLOGICAL BASIS OF THE MODERN CURRICULUM

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1) HOW EDUCATIONAL PSYCHOLOGY AND CHILD DEVELOPMENT CAN CONTRIBUTE TO THE PREPARATION OF TEACHERS

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The series of papers* included in this issue of THE JOURNAL OF EDUCATIONAL PSYCHOLOGY gathers together a number of facts and principles from some of the more active areas of psychology, focusing them upon the problem of curriculum determination. The effort to bring psychology to bear on this problem raises the larger question of the place of psychology in the preparation of teachers. Since the teacher's function is to promote learning,

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and since learning is a psychological process, it follows naturally that courses in psychology should be included on the teacher's transcript of credits. The practice has been more nearly universal than the inclusion of any other single subject-matter course. Historically, as departments of psychology and education, by a kind of mitotic process, separated from departments of philosophy, and as professional departments, schools, and colleges of education escaped from the academic entanglements of liberal arts colleges, psychology as a subject followed along. Though modified, through its emphasis on practical problems, it came to be built into the state requirements for teacher certification.

The tendency for the courses to become formalized has been counteracted in large measure by what is almost a proliferation of more specialized courses, by the energetic researches of psychologists in the general field, by educational psychologists in the applied field, and by the brave efforts of those who have sought in various ways, through speeches, articles, textbooks, and yearbooks to bring the findings of research into the day-to-day practice of teachers.

But a visit to a school is still a saddening experience to an educational psychologist. With due respect to the many exceptions, so many things are wrong, so completely wrong that the visitor wonders what has become of all the well established 'principles' that the teachers and administrators supposedly learned in order to pass the psychology courses required for their certification.

After a few moments of silent meditation he talks to some of the teachers. He shortly discovers that he is a mere theorist, that what he is talking about, if it is comprehended at all, "won't work out in practice." The ego-protection of some of the older teachers, particulary some who have somehow obtained a Master's degree, sets up a deflecting screen which his words do not penetrate. The principal or superintendent is open-minded in conversation, but his autocratic control may be such that one wonders that the teachers are doing as well as they are.

Downcast, but determined not to employ any mechanisms of projection, the visitor returns to his office, he looks over the list of courses offered in educational psychology and a number of textbooks, he scans the objective-type questions devised to puzzle

the students, he considers the teaching techniques of his colleagues—yes, and his own. He comes reluctantly to the conclusion that improvements can and should be made at the source. The whole program should be studied in an effort to determine ways in which it can be made more effective.

He gets out a sheet of paper and a pencil and jots down some of the categories, and comes out with something like the following:

1) *Catalog offerings.*—How many different courses are there? Is such a fractionation of the field desirable? How much repetition of content is there in courses likely to be elected by the same student? What is the difference between undergraduate and graduate courses?

2) *Course content and method.*—What are the objectives of the course? Are they embodied in the examinations used? What, exactly, do the students learn—facts, generalizations, skills? Are the same topics found in courses—and textbooks—in what are supposedly different courses dealing with different fields?

3) *Fields in educational psychology.*—Shall the classification of fields be based on the age of the children studied? If so, then we have child development, and psychology, mental hygiene, intelligence, or measurement of nursery school, kindergarten, and elementary-school children, and adolescents, or the psychology of elementary—and high-school subjects. Or shall it be according to the needs and purposes of the student? Then we have learning, guidance, adjustment, measurement, etc., treated for the entire age span.

4) *Relation to education subjects.*—How can psychological facts and principles be brought to bear on the several special areas of instruction, on administration, curriculum, and methods, on physical education, vocational education, and special education?

5) *Learning.*—How is it possible to make instruction more effective? How may an understanding of such processes and conditions as motivation, individual differences, perception, conditioning and problem-solving on the part of the teacher improve the learning of pupils in symbolic, motor, aesthetic and social situations?

6) *Professional services.*—What are the functions of the teacher, the guidance worker, and the school psychologist (if any), in improving instructional methods, promoting pupil adjustment, and improving parent and community relationships?

There are already fairly good answers to many of these questions, but more and better answers are needed. The papers which follow suggest various contributions that several fields of educational psychology are making and can make to the problem of curriculum determination. As we gradually broaden our field of study and improve our answers to such questions as these, it seems probable that our contribution to the preparation of teachers will be concomitantly improved.

2) THEORIES OF BEHAVIOR AND SOME CURRICULUM ISSUES

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When Hilgard,[4] (p. 326) tells us that "there are no laws of learning which can be taught with confidence," and that "even the most obvious facts of improvement with practice and the regulation of learning under reward and punishment are matters of theoretical dispute," we should not be surprised that curriculum, which rests in considerable measure upon our concepts of what is valid in the psychology of learning, is itself confused and uncertain. A theory of the nature of the human organism and how it behaves and learns is central to any theory of the nature of curriculum, and curriculum issues must be settled in part according to what we believe about human nature.

The contribution which the scientific study of human behavior and systematic formulations of generalizations concerning it have made to the curriculums of the contemporary school at all levels is not inconsiderable. This whole symposium stands as an illustration of psychology's contribution to curriculum. On the other hand, research and generalizations concerning human behavior have not produced a universally acceptable theory. Consequently, the various and diverse curriculums which are current often find their justification, in part, in theories of behavior which are various and diverse as well as current.

For the purpose of dealing explicitly with the topic of theories of behavior and curriculum issues, we shall consider two basic concepts of the nature of the human organism and within the second of these, two subsidiary but clearly differentiated concepts. The traditional concept of man is that of a 'free soul.' By this we simply mean man is a rational creature, endowed with a soul (independent of the body) and free as a moral agent. This shall be the first of our two basic concepts. The second is that of man as a 'dynamic lawful system.' This is psychology's concept. Within this basic concept, man may be viewed either as a 'machine,' largely subject to the laws of environment; or, man may be viewed as a 'dynamic force,' not quiescent, but one energy system interactive with other energy systems which are the environment.

Man as a free soul is a concept which has ancient and honorable lineage[1] (Ch. I–VII). It conceives of man's behavior as being manifest in bodily response but controlled by mind. Here we have the familiar dualism of mind and body. Man's mind or soul is incorporeal, not subject to material laws, but obedient to spiritual laws that are without analogy in the physical world. This concept of man is still pervasive in our culture and has a respectable intellectual status, even though it seems to be without a respectable psychological status. Psychology, adopting parsimonious concepts, feels that it can describe man without recourse to non-material concepts. Only that which is knowable and verifiable through sense perception has psychological validity. The curriculum which has meaning under the concept of man as a free soul is the traditional liberal curriculum. It is a curriculum of discipline and of work for its own sake. Subjects have meaning not primarily because their content has meaning, but because they have generalized disciplinary value. Work has virtue, not because it fosters accomplishment but because it has 'spiritually healthy' correlates. The body with its physical appetites and demands is recognized, but the satisfaction of these demands is a secondary problem. Acquisition through training of ways to meet these physical needs is a problem of minor educational significance. Education is primarily intellectual, not as the scientist conceives of intellect but rather as the classifical humanist conceives it—which includes intellectualizing the emotions and exalting 'things of the spirit.'

In answering questions which the psychologist might pose concerning issues which are important to him, issues of capacity, motivation, practice, and transfer—the following statements might be made by the person who holds to a free soul concept of human behavior:

1) All individuals have the potentialities to become educated.

2) Motivation must be raised from the level of material needs to those of spiritual needs. Needs which the psychologist might label as basic must often be uprooted, and value systems that are often non-material must be established.

3) Practice or drill has significance, not so much because it establishes right responses, but because it disciplines the individual to habits of work.

4) Education and transfer are in a sense synonymous. The

educated person has not necessarily learned the specific responses essential for specific situations but makes adjustments to the exigencies of life because he intuitively senses what will be the appropriate conduct. Generalized ability to think marks the educated man.

The concept of human nature and of education which we have so briefly sketched has little psychological standing, but that it has standing in our culture dare not be denied. The professional educationist perfunctorily dismisses these concepts, but he is unrealistic in his approach to educational and curriculum issues of our age when he does so.

The psychologist treats of man as a dynamic, lawful system. American psychology has divorced itself from philosophy. Man is observed as any other scientific phenomenon is observed, and only conclusions which are within the boundary of scientific verifiability have status insofar as the psychologist's theory of human behavior is concerned. However, psychologists, within the boundary lines which they have drawn and agreed upon, have two fundamentally opposed concepts of human behavior. Hilgard has made clear the contrasts in his *Theories of Learning*.[4] He, along with others, acknowledges two basic systems, association systems and field systems. These are systems of behavior as well as systems of learning.

The association theorist,[7] (Ch. I–IV) with his paradigm of stimulus-response and the S-R bond, makes of man a machine. The environment plays upon man, feeding him stimuli through the avenue of his sense organs. As a result of a sort of mechanical sorting, responses emerge as muscle contractions and glandular secretions. The ultimate expectation of the association theorist is that he will be able to predict behavior by mathematical formulae, quantitative in character, the variables of which are largely environmental. The variables on one side of the equation are derived from environmental observation, those on the other from observations of overt (hence extra-human organism) responses.[5]

A curriculum tailored to association theory has simplicity. The responses which are desirable and which mark the educated person are identified. The stimuli which lead to these are likewise identified. Stimuli are presented, the response is in some way elicited and fixed. The educational problem is solved.

The appropriate response is elicited and fixed through the familiar procedures of conditioning or of tolerable repetition, i.e. repetition plus the operation of the law of effect. Curriculum is concerned with the specific responses that the human being needs in order to react appropriately to the multiplicity of situations he may face in life. Because curriculum is concerned with responses, the stress is on product rather than organic process. The familiar procedures of job analysis, inventorying areas of living, and so on, as methods of determining curriculum have their validity under this psychological concept of human behavior.

If the psychologist again asks his questions concerning capacity, motivation, practice, and transfer he gets these answers:

1) Individual differences in capacity may be recognized but they are secondary to the system. Environment is primary.

2) Motives are themselves stimuli which may be controlled from without.

3) Practice is fundamental, particularly when coupled to the law of effect.

4) Transfer, while acknowledged, cannot be counted upon. It is better to anticipate the response needed for a situation and to establish it directly.

This concept of human behavior with man conceived as a machine which we have here sketched and its concomitant curriculum is now generally prevalent in American education. This statement may not always be explicitly acknowledged, but analysis of textbooks and workbooks, of courses of study and units of work, as well as of processes of instruction, would substantiate the statement.

The field theorist,[7] (Ch. V, VI) in psychology looks upon man as an energy system attempting to maintain dynamic equilibrium with other energy systems which interact with him through his sense organs. The physical model is not a machine but such other energy systems as the whirlpool, soap bubble, or candle flame,[4] (p. 14). Man is conceived as an adaptive creature; cognition and anticipation are important in making adaptive responses; the dynamics of growth are more significant than status at a given time; responses are not necessarily selected out of a repertory of previously acquired responses but represent a reorganization of behavior in terms of present demand; in short, the integrated, cognitive character of adaptation is the primary fact of human behavior.

A curriculum which has validity for this theory is more difficult to describe than the curriculum which is correlated with association theory, in part because we have no clear-cut model. The theory is relatively new, is just becoming understood by educators, and its curriculum implications have not been fully derived. We shall make a few inferences concerning the curriculum which may ultimately be so derived. Probably a specific content for such a curriculum is not essential. The organism must have opportunity to interact in order to learn patterns of adaptation, and emphasis is on process rather than on product. The 'how' is as significant as the overt observable response.* Stress is on integrated learning, but the process and location of the integration remains unclear.

Answering once again the questions concerning capacity, motivation, practice, and transfer the field theorist says:

1) Individual differences are recognized and the rôle of the individual in the learning process is crucial. Maturation is a basic concept.

2) Motivation is at the center of the curriculum because it is in response to basic needs that man adapts and learns.

3) Practice is not synonymous with repetition. The individual makes successive attempts at adjustment, but his responses are each one modifications of previous responses. Effect is not an imposed reward or punishment but an internal sensing of the adequacy or inadequacy of response in terms of motivation.

4) All responding is in a sense a transfer effect in that all situations are new but responses are in terms of reorganization of previous modes of response.

Field theory and the curriculum to be derived from it does not yet have the clear-cut structure which association theory and its derived curriculum possess. As we implied earlier, this may be due in part to the relatively recent discovery of the theory by the educator. It may also be that the theory is actually more complex than is association theory. Perhaps we all must be patient while this 'field theory curriculum,' which may be thought of as being in its infancy, reaches its maturity under the stresses

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* For example, we are more interested that the child 'think out' the response to 2 + 2, i.e. that he see the meaning of 4 as the appropriate response to 2 + 2, than that he automatically fixate 4 as the response by associative learning. See [2] and [6].

and strains, that is the stimulation, of educational dynamics with time as an important dimension of this maturation process.

We have sketched three concepts of human behavior. We have suggested the curriculum for which each theory provides a psychological rationale. We have told how each theory answers certain questions concerning capacity, motivation, practice, and transfer.

How now can we deal with contemporary curriculum issues? As we might suspect, no curriculum either in theory or practice is completely consistent with a given theory of behavior. If we accept Caswell's classification and analysis of curriculum as scientific subject-matter, broad fields, areas of living, or emerging,[3] (197–208) we will find that each of these curriculums possess certain strengths and certain limitations to proponents of each of the theories of behavior. Behavior theory and curriculum theory have not perfectly meshed. A subject-matter curriculum perhaps has given and continues to give most comfort to those who view man as a free soul. The broad fields curriculum achieves a certain integration but a limited one. It gives no assurance of integrated, adaptive behavior to the field theorist. Areas of living curriculums seem most valid to those who stress relevancy to specific demands, who have little faith in transfer, and who place a premium on motivation. The emerging curriculum is consistent with field theory concepts of development but it gives little recognition to cognition and generalized behavior processes. This type of evaluation of curriculum in terms of behavior theories is merely suggestive and fragmentary. An adequate evaluation would necessitate detailed analysis. What, for example, are the psychological assumptions underlying Harvard's report on *General Education for a Free Society*, and the Educational Policy Commission's *Education for All American Youth?*

The problem of curriculum issues and behavior theory may be dealt with better if expressed as issues of objectives, scope, sequence, and organization. What inferences concerning these issues can be made from behavior theory? The following statements are made not as positive assertions, but rather as tentative hypotheses concerning these issues and behavior theory.

A curriculum which develops man as a free soul is limited and narrow in its objectives. It is unitary in its scope. Sequence is not highly significant, although logically derived. The curricu-

lum is also characterized as having a logical organization. Association theories are consistent with a curriculum for which the objectives are multiple and varied. The scope of the curriculum is broad, diversified, but often fragmented. Sequence is logically determined, and organization is frequently logical although it may be in terms of functional relations. Field theories are consistent with a curriculum for which the objectives are generalized rather than specific, although these objectives are not essentially unitary. The scope of the curriculum is determined by a study of the organism rather than by an analysis of the environment. Sequence is perhaps secondary to the ongoing integration of experiences—that is, the activity of the learner determines a sequence which is not always predictable rather than having a sequence determining the activities. An organization which is often characterized as psychological rather than logical seems to characterize this curriculum.

A quite different pattern of behavior theories as they relate to curriculum issues could be worked out and have as great validity as does this presentation. This approach is but one of several which might have been made. Our chief purpose has been to demonstrate that a relationship exists but that this relation has not been fully sensed and exploited by those who make curriculums. We have also avoided committing ourselves to a particular point of view in the area of behavior theory or of defending certain hypotheses as related to curriculum issues. It would be an error to infer that we are without conviction. We have deliberately been descriptive rather than argumentative because we have felt that the more important purpose at this stage is to point out relations which are too often unclear rather than to provoke further controversies among many who do not sense one area from which data may be drawn to settle old issues.

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3) INDIVIDUAL DIFFERENCES AND CURRICULUM PRACTICE

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When a random group of six-year-olds enters the first grade, two per cent of them will be below the average four-year-olds in general mental development and two per cent will be above the average eight-year-olds. Disregarding the extreme two per cent at either end, there is a four-year range in general intelligence. By the time this group has reached the age of twelve (sixth grade level) the range will have increased to almost eight years.[7,9] As long as all the children of all the people remain in school the range continues to increase, even through high school. When the educational achievement of a typical sixth-grade class is measured we find a range of approximately eight years in reading comprehension, vocabulary, arithmetic reasoning, arithmetic computation, the mechanics of English composition and other forms of achievement. In almost any sixth-grade class will be found a pupil with second-grade reading ability and another with tenth-grade reading ability.[4] In any grade above the primary level will be found the complete range of elementary-school ability. When the General Culture battery, consisting of achievement tests in general science, foreign literature, fine arts, and social studies, was administered to high-school and college seniors in Pennsylvania,[6] it was found that the upper ten per cent of high-school seniors were above the college senior median and that the lower ten per cent of college seniors were below the high-school senior median.

Although such facts should be basic data in educational thinking, traditional school organization and curriculum practices ignore them. The idea of homogeneous groups of pupils receiving uniform instruction by mass educational techniques from uniform textbooks dies hard. The assumptions persist: that grade levels signify rather definite stages of educational achievement, that the course of study for a grade is the prescribed academic requirement to be administered uniformly to all pupils, that all pupils in a grade should be capable of coping successfully with the work outlined for that grade, that a pupil should not be

promoted to a grade until he is able to do the work outlined for that grade, that when individual differences are provided for all pupils can be brought up to standard, that maintaining a passing mark results in homogeneous instructional groups, and that when relative homogeneity of a class does not prevail it is the result of poor teaching or lax standards.

Uneven educational progress has been a major concern of the schools for a long time. The graded school idea was sponsored by Horace Mann, Henry Barnard, and their co-workers during the 1830's and 40's. By 1870, even the one-room rural schools had been graded. Between this time and the 1920's when intelligence tests were first used for grouping, numerous 'patented' plans for preventing 'laggards in our schools' had been tried. The earlier proposals dealt largely with promotion policies: annual, semi-annual, quarterly, subject and special promotions all had a trial. Other plans were concerned with 'holding standards constant' and increasing instruction for slow pupils as in the assisting teacher and vacation classes plans. Others held time in school constant and differentiated the curriculum for fast, medium, and slow learners, while still others held the curriculum constant and differentiated time spent in school. Plans for the individualization of instruction such as the contract plan are more recent. Several of these schemes involved classifying pupils into slow, medium and fast learners. Before the development of standardized intelligence and achievement tests, classification was based on school marks and teacher judgment, but with the development of such tests homogeneous grouping was widely accepted.

The effectiveness of general ability grouping depends upon the relative magnitude of trait differences. It is based on the hypothesis that there is relatively little variation from trait to trait within the individual, that all traits with which the school is concerned are substantially correlated. Evidence from several overlapping fields of investigation tend to refute this hypothesis.[1,4] The first is concerned with basic theories of mental organization and primary mental abilities, the second with studies of the so-called 'idiot savant', the third with asymmetry of development in normal and gifted individuals, the fourth with direct measures of trait variability, the fifth with evidence of correlation between traits, and the sixth with the overlapping in

educational achievement of groups which have been made homogeneous with respect to some measure of general ability. Tentative generalizations drawn from this research may be stated as follows: trait variability in the typical individual is eighty per cent as great as individual variability in his age group, trait differences are normally distributed, some individuals are twice as variable as others, and there is no relationship between general level of ability and the amount of trait variability.

Under the most favorable circumstances, that is, when pupils are grouped in X, Y and Z fashion on the basis of an achievement test battery which is heavily weighted in favor of reading and arithmetic scores, we may expect a reduction of about twenty per cent in reading and arithmetic variability.[4] The extreme X and Z groups will overlap approximately eighty per cent. Instead of a range of eight years in reading ability at the sixth-grade level the teacher has, after grouping, a range of 6.4 years. In other subjects such as art, music, handwriting and mechanic arts, the reduction of range approaches zero. Consequently, when grouping is practiced, it must be on the basis of status and needs in specific learning areas, that is, pupils must be grouped differently in each subject area. Such groups should be flexible in organization and specific in purpose.

The effect of promotion policies on the variability of classes and achievement standards has commonly been misunderstood. There is a general belief that the trend toward universal promotion has increased the variability of upper-grade classes, lowered their mean achievement and reduced the incentive of pupils to learn. Controlled studies[4] have shown otherwise. Schools with rather strict promotion policies retain the slow learning pupils from one to five years longer. The consequent excess of dull pupils in these schools lowers the intellectual level of the classes and achievement is significantly less. The excess of retarded pupils in the upper grades aggravates the range of ability problem and the variability of classes is as great as when universal promotion is practiced. Studies[4,5] have consistently shown that the typical slow learner achieves more when promoted regularly than where he is retarded.

Another prevalent but erroneous idea concerning individual differences is that instructional groups can be made more homogeneous in a given achievement area through effective teaching

and diligent study. It keeps company with other ideas inherent in the traditional conception of the schooling process. Education is conceived to consist of learning such things as are found in course of study and textbooks: spelling words, type problems in arithmetic, causes and results of wars, states and their capitals, explorers and where they explored, names and dates, cities and their characteristics, countries and their products, and the seven basic food groups. Good teaching is conceived to consist of threatening, coaxing, drilling, rewarding, punishing, driving, testing and reviewing until the pupils can verbalize these facts. Providing for individual differences means getting all pupils over the passing mark. What harm is there in this simple conception of the schooling process which substitutes information for education?

The basic problem here is concerned with the effect of a period of learning upon individual differences. Are individuals more alike or less alike with respect to a given ability after a period of instruction? Much research,[1,4,8] on this problem is available; it is somewhat contradictory and difficult to interpret, but the following generalizations seem warranted. If the responses to be learned are sufficiently simple and the goals have been so limited that a high proportion of the group can master them during the period of learning, the variability of the group becomes less; but if the task is complex, involving the higher mental processes, and the goals unlimited so that the abilities of the most apt members of the group are taxed during the period of learning, then the variability of the group increases.

Limited educational goals in the form of lists of facts, principles, and type problems, which may be memorized in a rote sense for examination purposes to give a semblance of uniformity of achievement in meeting the requirements of a passing mark result in highly temporary learnings. Early objective tests tended to emphasize this type of learning. Tests of retention administered from three months to three years after a course was completed revealed from thirty to ninety per cent loss.[3,10,11] The forgetting curves for such learning closely approximate those of non-sense materials.

Although deterioration is the rule when factual tests are repeated, it has been demonstrated[10,11] that tests of problem-solving ability, reading comprehension, the application of prin-

ciples to new situations, organizing ability, and the interpretation of new data, measure permanent learnings. That is, meaningful, structured learnings involving problem-solving and application abilities are relatively permanent. Such learning involves unlimited goals and when the abilities of all members of a group are taxed, individual differences increase during a period of learning. The conclusion seems justified, that the emphasis which the traditional schooling process places on striving for homogeneity in classes, getting all students over the passing mark, and providing for individual differences to bring all pupils up to standard, encourages teachers to set goals for instruction which result in temporary factual learning.

Our conclusion up to this point must be that the more effective the instruction, the more individual differences are provided for, the more heterogeneous instructional groups become. Hence, our central problem is how best to meet the needs of individuals in groups of widely varying ability. This calls for changes in attitudes and beliefs regarding the schooling process and for new administrative and curriculum policies. We shall suggest some of them.

The administrative policies have two purposes: (1) to make it possible for the teacher to know the student well enough to meet his needs, and (2) to provide instructional material with a range of difficulty and interest appeal commensurate with the needs of the instructional group.

1) The size of classes must be reduced to not more than twenty-five pupils in the primary grades nor more than thirty above this level in academic areas of the common schools. The practice of giving each elementary-school teacher forty new pupils each year, and of having the high-school teacher meet one hundred fifty different pupils each day, using uniform textbooks and mass instructional procedures precludes the possibility of meeting individual needs.

2) A systematic testing program revealing status and growth in the skills and abilities (not facts) required for optimum adjustment in the culture must be instituted with the results from kindergarten to college graphically portrayed. These begin with relatively undifferentiated tests (Stanford-Binet) at the pre-school level and reach a high degree of differentiation (Iowa Tests of Educational Development) at the high-school level.

The purposes of these tests are not the traditional ones, that of holding teachers and pupils to standards and as a basis for promotion and marking. The purpose is rather to enable the teacher to know more about the pupil, the books he can read, the type of problems he can solve, the amount of improvement that can be expected, in short, what he reasonably can be expected to do.

3) A permanent record folder containing in addition to the test results, the health record, samples of handwriting, creative written work, art work, etc., showing development since kindergarten, should be in the teachers hands, not in the office.

4) The practice of reporting to parents on cards or by letters should be abandoned in favor of personal conferences two or more times each year after the teacher has studied the pupil.

5) The primary basis for grouping children should be physical and social development (probably best indicated by chronological age) since these are the most obvious criteria of status in childhood groups. A child should live and work in the group he most obviously belongs with, one which accepts him and which he accepts.

6) There must be grouping within classes on the basis of status and needs in specific learning areas. These groups should be flexible as to size and duration and specific in purpose.

7) The practice of labeling school books by grade should be discontinued. A code number indicating to the teacher the difficulty of the material is sufficient.

8) In both the elementary and high school the practice of having a teacher teach the same group of pupils from three to six years should be encouraged.

9) At the high-school level there should be special honor classes for students who demonstrate unusual ability in the sciences, mathematics or language.

10) In the high school the practice of integrating English and the social studies in a four- to six-year coördinated sequence with two or three hour daily periods in a laboratory workshop should be encouraged.

11) A wealth of instructional material should be provided. It should have a range of difficulty, interest appeal, and content commensurate with the range of abilities and interests of the class. It should be in the classroom and workshop, not in the library or other special rooms.

12) The traditional inflexible short period daily program at both the elementary- and high-school level should be modified to meet the requirements of the modern curriculum.

The curriculum policies of the modern school have three purposes: (1) to provide flexibility of requirements in order that the potential unskilled laborer and the potential research physicist will not be held for the same requirements, (2) to free the teacher to plan for the welfare and optimum development of individual pupils, and (3) to broaden the curriculum sufficiently to recognize and reward the great variety of combinations of aptitudes and interests of students, enabling them to discover their strengths and weaknesses, and preparing them to fit into our complex society with its multiplicity of demands.

1) The curriculum content should be organized around large units or problems in the social studies and natural science areas. Some of the purposes of these comprehensive units are: (a) To make possible an appeal to many different interests. (b) To make possible the utilization of a wealth of reading materials with a wide range of difficulty, content, and points of view. (c) To provide possibilities for use of a wide variety of stimulating materials from literature, moving pictures, field trips, museums, journals and the radio. (d) To stimulate and make possible a wide range of activities in reading for different purposes, research, use of reference materials, writing reports and letters, interviewing, presenting oral reports, planning, organizing materials, seeing relationships, developing generalizations, dramatization, construction projects, understanding literature, music and art in proper context, quantitative thinking, making graphs, evaluating evidence, reading maps and diagrams, taking responsibility, coöperating in group activities, and developing understandings, ideals, beliefs, attitudes, and a sustaining intellectual interest.

2) The grade levels at which certain knowledge, skills, and abilities should be learned cannot be determined with any degree of specificity. The graded lists of skills and knowledge provided in traditional instructional materials should be used only as check lists for diagnostic purposes, as sequence materials in developing skills in subgroups, and as material to be emphasized at different times. Perhaps half the school time should be devoted to a systematic development of the skills necessary in the unit activities and related to them as much as possible. It should

never be considered that these itemized goals are to be achieved in a one-two-three fashion; once and for all time; out of their functional setting and natural context; and that all instruction should be organized around these piecemeal itemized goals.

3) The pupils should have a large share of responsibility for setting the immediate goals toward which they strive and for evaluating their own work in terms of these goals. This will help insure that the pupils develop high ideals of performance and will focus attention on the next steps in their progress.

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4) HOW THE PSYCHOLOGY OF MOTIVATION IS RELATED TO CURRICULUM DEVELOPMENT

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The curriculum of the schools should be made to meet the needs of children.

This statement is 'run of the mill' among curriculum builders, and it must be safe to believe that there is something to it. In any case, I leave it to suggest the frame of reference for these remarks about motivation and the curriculum.

But what does the statement mean? What do curriculum builders have in mind when they point to the needs of children? Here are some samples of needs that are mentioned in educational writings about child behavior.

The need for optimal health
The need for vocational preparation
The need for recreation
The need for rewarding social contacts

The list is a put-up job. But it may illustrate legitimately a common mixing of two rightfully separate categories.

Children need optimal health; they need vocational preparation. Here, we are talking about what, in the opinion of adults, children ought to have, but seldom if ever strive to get. Children need recreation; they need rewarding social contacts. Now, we are talking about what, in their own living, children very often strive to get, whether adutls like it or not.

The needs of the first class, like the need for optimal health, are only projected requirements. They are projected into children by adults, and they do no more than reflect the values of adults. One may call them 'normative needs' because they serve the one purpose of expressing social norms or standards. The important thing to be said here about normative needs is that they lack motive power. This is evident in the fact that we attribute them even to lifeless things, as when it is said of a house that it 'needs' paint.

The needs of the other class, like the need for rewarding social contacts, are not at all merely projected requirements that serve only to reflect adult values. They are positive conditions that

exist in children and, as such, they help to create child values. The already common name for them is 'psychological needs.' The point in calling these needs psychological is not that they are always known to the individual who has them. The point is simply that, as states of the person they belong to the network of psychological determinants. When they get linked with goals in the environmental part of this network, directed actions occur. Then, psychological needs become charged, as normative needs never do, with motive power.

The time was when the curriculum was based rigidly upon normative needs. Adults decreed that children needed—ought to have—a knowledge of Latin, mastery of the multiplication tables, a nice appreciation of Tennyson, proper manners, in short, 'the cultural heritage,' and, for good measure, periodical spankings. Educators undertook to see to it that children got these things. They tutored and implored with an awful sense of obligation, but without any regard for psychological needs. This worked out poorly, as we know. So often, normative needs ran counter to psychological needs, and the sure outcome was that children were unhappier than they deserved to be. Moreover, it is said that, for lack of 'motivation,' they took in little at a slow rate and then lost much of what they got, so that room was left for better education in behalf of normative needs.

A reaction set in early in the present century when Dewey started his experimental school. The new idea was to base the curriculum upon the psychological needs of children, and so to make education 'child centered.' Children were not to be frustrated by arbitrary rules and assignments. They were to be happy and well adjusted. But that is not all. In the end, the important normative needs were to be met because 'motivation' would, it was thought, guarantee high and efficient intake of the skills, ideas, attitudes, and the like that children ought to have.

Actually, this has all been easier said—*ad nauseum*—than done. But there is no denying that 'the new education' has taken hold. At least, the principle that the curriculum should be geared to the psychological needs of children is generally accepted. Let us be clear about the claims, already touched upon here, that are urged in support of this principle. Primarily, there are two. The one is that heed for psychological needs in the planning and management of the curriculum will promote the happiness and

personal well-being of individual children. The other is that this strategy will lead to the fulfillment of the really important normative needs of children, and so bring about the realization by the schools of their broader, social objectives.

One point, however, has become increasingly clear. It is that a *laissez-faire* scheme of teachers and things cannot implement effectively the principle of gearing the curriculum to psychological needs. Distressing experience has shown that it is not enough to 'enrich the environment,' bring on the children, and then wait for their psychological needs to do the rest; that one expects too much of children in leaving them to lay down their own curriculum in answer to the question asked each morning: "What would you like to do today?" The formula for these practices contains but two ingredients: resources for action and a negative, pseudo freedom which consists only in the absence of restraint. Plainly, the resources are indispensable; but we have discovered that real freedom for children to make the most of their psychological needs is far more than the absence of restraint, that it is permission plus a state of affairs which occurs now and then by happy accident, but usually has to be arranged. Behind this discovery is the insight that psychological needs by themselves get nothing done for the child; that, rather, they function only interdependently with abilities, with environmental facts, such as goals, means, obstacles, and with other determinants in the context of behavior. Arranging real freedom for children to capitalize on their psychological needs means controlling in some degree the different parts of this context. But what specific arrangements have to be made? I would like to consider two that look to be essential. Boiled down, they are: 1) putting things in order, and 2) adjusting things-to-be-done to abilities.

The first consists in regulating the situation of the child so that, to him, it is understood or, as some prefer to put it, 'cognitively well structured.' An emigrant looking for freedom arrives in New York City. At the time, there are no physical things in the way, and he has the promised permission to do as he likes. But everything is new to him and all in a muddle. So long as this is true, he is not yet free, nor can he be until things get straightened out. The same holds for a child at school when, surrounded by 'materials' galore and many other rudderless children, he is told by a teacher that now he can do as he pleases.

Because the emigrant and the child are in poorly structured situations, neither is free to do the things that he needs to do.

Arranging school situations so that they are cognitively well-structured requires, first, of those who are in charge of the curriculum, that, beyond arousing needs, they define goals, or, better, help children to do so. This is no easy matter like the one of setting up lesson aims that suit the teacher's wants, but not the child's. It is, I take it, a difficult matter, the most essential point of which is that children can be helped to define goals that really exist for them only after their psychological needs have been diagnosed. Going about it otherwise means returning to a curriculum based upon normative needs.

It might be thought that in diagnosing a need one puts a finger on a goal that is known to the child, so that there remains no problem of defining ends or objectives. We used to think that way about instincts. Here, it is urged that children do not necessarily know what, psychologically, they need. Moved strongly by a longing for status in a group, a boy may understand nothing more about the whole thing than that he wants to punch another boy in the nose. Clinicians, and some teachers, have learned to prove the existence of needs like this one by watching for a variety of symptoms;* but when that much has been done, there is left over the task of helping the child to settle on a potentially satisfying goal. In this case, it could be carrying the lead in a school play, taking charge of the blackboard erasers, becoming the homeroom secretary, or all three, and each with aiding and abetting by the teacher. In any case, the child is not left unfree because he is in the dark with needs, but without goals to go with them.

Arranging school situations so that they are cognitively well-structured requires, secondly, that the child be helped to define paths leading to his goals. A goal can be only a point at a dis-

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* The problem of diagnosing the psychological needs of children is a big and significant one. I am not referring to the old quest for the needs of children-as-a-class, which, as many see it now, was futile and misguided. Nor am I thinking of tests (not even the Rorschach), although they often give valuable information along this line. I have in mind the problem of setting up criteria that adults, like teachers and parents, can use in diagnosing the important needs of particular children in the circumstances of everyday life. But discussion of this problem cannot be crowded in here.

tance, with a void in between. Then, all the child can do is dream about it. On the other hand, a goal can be an extended region of activity the finish line of which is tied in closely with steps on the way, so that these steps become parts of the larger goal-structure. John wants to 'play in the band.' An adult at school has helped to set up this goal, but lets it go at that and, except for tall imagining, so does John. Henry, after exchanging ideas with his teacher, wants to 'mow lawns or deliver papers to earn money to spend on a cornet to blow thirty minutes everyday so he can play in the band.' He can act with some degree of effectiveness because there is a path to follow. Henry's teacher has helped to arrange a situation in which a 'goal with a path leading to it' are defined. Situations like this increase the freedom of children to satisfy their needs.

A third requirement, if school situations are to be structured well, is that barriers be definite. It is true that due allowance for psychological needs calls for the minimizing of restraints. At the same time, an unequivocal 'no' may help a child to know where he stands, and thereby increase real freedom. 'Keep Off the Grass' and 'Do Not Enter' signs do the same for adults. Because it is clearer, a 'no' can be more liberating than weasel words, which only create uncertainty and insecurity.

A special requirement in 'structuring' the situation of the child is that of letting him in on what lies ahead. The idea here, as some word it, is to give children a 'future time perspective.' This becomes increasingly important as pupils grow older. In the school of the old education, the teacher was an authoritarian leader, and like all autocrats, she took charge of the future. The child rarely could look ahead and know for sure what was coming next. But what lies ahead is equally unknown to children in a *laissez-faire* situation, where nobody knows what the future holds. The importance of this factor is plain. Constructive action requires planning, and planning is impossible if the child is bound to the present. Also, with absence of time perspective there goes a loss in security for, if the future is blank, happenings to come are seen as potentially good and bad.

To sum up, when the school situation is cognitively well-structured, the child has definite goals along with paths leading toward them, is clear about what he may not do, and knows what is coming next. It is suggested that in schools with adequate

resources for action where situations of this kind are arranged, children are in a good position to get done what we used to only hope their needs alone would make them do.

I turn to the second arrangement by which to increase real freedom. It consists, again, in adjusting 'things to be done'—in the school, curricular offerings—to abilities. Often, resources for action in the objective environment are not accessible to the child in any way that counts as far as behavior is concerned. This is true of readings on the twelve-year mental level in a school library for children mentally eight years old. In every such case, the child is not really free to cope successfully with the things at hand, no matter how strong his psychological needs to do so, because they are beyond the reach of his abilities. It is clear, then, that abilities do limit the range of the behavior depending on psychological needs. But there is a larger aspect of this problem.

In our culture, however it may be in others, children have needs for self-esteem and social approval, each gratified by success and thwarted by failure. Owing to their broad range of influence within the person, these 'ego needs,' as they have sometimes been called, are of fundamental importance. When they are satisfied by success, the goals set by the child are high, and his morale is good. When they are thwarted by failure, the goals set by the child are low, and his morale is poor. Success, here, means doing as well or better than one aspires to do, and failure means the opposite—performing below one's 'level of aspiration.'

Now, success experience has been shown to require a nice balance between abilities and the demands of a situation. More specifically, success is possible and satisfaction of the ego needs can occur, only when the activities which the child undertakes fall within an intermediate zone of difficulty. This generalization has been supported experimentally, and it is illustrated often in everyday life. Thus, a boy of twelve cannot experience success if an athletic coach imposes on him the goal of high-jumping seven feet. On the other hand, he cannot experience success if given no higher objective than that of jumping one foot. He would clear the bar at this latter height, but the performance would be too far below his level of aspiration to yield the true success experience which derives from gratification of the ego needs. The same child will experience success if, advised possibly

by a wiser coach, he sets for himself the goal of jumping four feet, and makes it.

In instances like the last, requirements are adjusted to abilities in such a way as to make it possible for the child to gratify his ego needs and act effectively. Such adjustments are impossible if the curriculum is inflexible and burdened with arbitrary standards. They are impossible, too, in a *laissez-faire* situation where the whole field of action is so unclear that the child has no way of judging what he can or cannot do, and gets no help in setting his goals. If the proposed adjustments are to be made correctly, the child must be given considerable latitude to elect his own tasks and to set his own pace. Otherwise, there is almost sure to occur frequently the imposition of requirements which are too hard or too easy, too far above or below the range of difficulty where success is possible. But what becomes of normative needs if children are allowed so much liberty? In the degree that the child is encouraged to choose his own activities and to set his own pace, will he not loaf, get by on as little work as possible, and so fail to accomplish anything worth while? It is suggested that he will not—so long as one condition holds. The condition is that the child be in a situation where he enjoys the essentials of real freedom. When children are free, as that state of affairs is understood here, they do not get by on as little as possible. The children who do are precisely the ones who are hemmed in by just those inflexible requirements and arbitrary rules that are supposed to make them work hard! In our culture, at least, children given a decent amount of freedom try to achieve on the highest level possible for them precisely because their ego needs, for self-esteem and social approval, drive them to do so. For evidence on this, one has only to follow a small boy through a typical Saturday, or refer to some of the studies on level of aspiration. There is no argument at this point for a soft curriculum, only for one which, because it can be adjusted to the abilities of children, gives psychological needs a fair chance to do their part in bringing about constructive action.

The following are key points of this discussion. Applying the psychology of motivation to curriculum development means in part gearing the curriculum to psychological needs. This calls for a liberalizing of standards and requirements. Yet it calls for more than a purely negative 'freedom,' for children are not

often motivated to act effectively when they are only confronted with raw resources for action and then left to shift for themselves. Children can be motivated to act effectively if certain controls are exercised over determinants that interact with psychological needs in the whole context of behavior. These controls may be looked upon as helping to guarantee a real freedom for children to behave as, in itemizing their normative needs, we say they should.

5) HOW A PSYCHOLOGICAL APPROACH TO HUMAN VALUES CLARIFIES EDUCATIONAL OBJECTIVES

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Before suggesting ways in which a psychological approach to human values might or actually does clarify educational objectives, it may be psychologically sound and philosophically wise to recognize that a two-way relation exists or should exist between educational psychology and the objectives set up by philosophers working with school administrators. The choice among such educational objectives as vocational efficiency, esthetic appreciation, and the understanding of family life makes considerable difference in the data presented by the educational psychologist. While we are telling the philosophers and administrators how their objectives would be clarified if they made a psychological approach to values, we should not forget to tell ourselves how our own work in educational psychology may be clarified through considering the objectives chosen for the modern school. As in most psychological processes, clarification comes through noticing the relations in more than one direction. This principle applies, likewise, to the general topic of this session, for we recognize that even a modern curriculum, not to mention prevailing programs, is based more solidly upon tradition than upon psychology. Also, we see that educational psychology is still restricted too narrowly by limited views of the curriculum and its objectives. Only as we substitute the concepts of multiple causation and circular relations for one-way, cause-effect assumptions dare we ask how a psychological approach to human values clarifies educational objectives.

What does psychology tell us about human values? First, that the values the school emphasizes are ineffective unless they are within human capacities and in accord with the motives of the boys and girls at various ages. Different values are appropriate for the beginner in the kindergarten and the adolescent in the high school. The psychology of development and learning would bring the objectives of the modern school down from adult-level formulations to the child's world of active experiencing. Even collegiate education has been adjusted in some places to the

emotional and social needs of maturing youth rather than remaining narrowly vocational or narrowly academic. The scientific descriptions of organic and emotional requirements and of typical human behavior, presented by psychologists, have helped schoolmen and philosophers to choose objectives more realistically and, consequently, attain them more fully.

Another broad contribution of psychology to the objectives set for the public schools moves in a sharply contrasting direction by enlarging the concept of 'human nature' and exposing false assumptions about limited capacities of certain groups, classes, and ages. Through an integration of clinical, cultural, and developmental studies, the social origins of many deficiencies found among school pupils have been demonstrated. Instead of regarding these limitations as unmodifiable ingredients of human nature or fixed characteristics of racial groups, these learning blockages and behavior twists are seen as reflections of mistreatment during infancy, of superstitions and taboos, of class distinctions, and of other cultural factors. Since these limitations have cultural origins, we believe that over shorter or longer periods the difficulties of learners may be removed through psychological education and intelligent social organization. Thus, the modern school enlarges the range of its objectives for the less fortunate children, opens participation in the arts to all children instead of just the talented, and offers social-moral choices to groups formerly considered too young to assume joint responsibility. The school now finds new objectives in parent-teacher education toward replacing the emotional blocks of children with experiential opportunities, and in the education of youth in such crucial areas as sex attitudes and family living. Through contrasting contributions, psychology has performed the double function of bringing the ladder of objectives down to the ground so every child can reach the first step, and at the same time lengthening upward the ladder of opportunity for all children by removing cultural obstacles, which are now seen as unfortunate accidents of the unscientific past. Man turns out to be an abler learner than we thought.

The central objective of our public schools is democratic living. Educational psychology clarifies the meaning and values of democracy in numerous ways. The fact of individual differences in abilities and interests is assimilated to the prevailing complex

social organization by demonstrating how individual development depends upon cultural communication and how diversity gives strength and stability to a social group. That primary essential of democracy, 'respect for the individual,' is supported by psychological evidence that development in any specialty depends upon freedom for all aspects of life—physical, intellectual, emotional, and social. The sharing of responsibility, as complementary to freedom in a democracy, ranks high in the psychological requirements for effective learning. The soundness of our democratic philosophy depends in large measure upon its connections with a psychology that is broadly scientific. Recall how heavily philosophers of democracy, like William James, Boyd Bode, and John Dewey have leaned upon psychology, while they were contributing to both fields. Since many of the problems of democracy are still unsolved, it is fortunate that psychology, with the other sciences, looks forward to further research. When psychological studies expose conflicts between certain social practices, whether in infant care or economic organization, and the conditions favorable for human values and democratic living, psychology is locating for itself and for philosophy tasks ahead. Many of these problems require social experimentation upon levels not yet reached. Consequently, leadership in the clarification of human values and the meaning of democracy is a joint responsibility of psychologists, philosophers, and school administrators.

In this statement we have assumed that educational psychology covers much ground. No doubt we all agree that educational psychology should concentrate upon learning in the school. When we begin to investigate how learning occurs, however, we find that important factors have been revealed by clinical studies, by experiments with lower animals, by cultural studies of diverse classes and social groups, and by a variety of other sources in biology, sociology, biography, and anthropology. The educational psychologist dare not neglect these contributions from related fields as long as he accepts the modern school's concern with the whole personality of the pupil. Consequently, educational psychology recognizes all scientific studies to the degree that they throw light upon development, learning, and human values, although the focus of experimentation and research should be upon the problems faced in the public schools.

Another way of putting the matter is to register our opinion that many schools still set up their objectives without adequate reference to educational psychology. The objectives themselves may be desirable enough, but the actual steps by which these goals become phases of experience for all boys and girls depend upon processes of development and learning to which educational psychology can contribute much. Teacher education requires a kind of psychology that bridges the gap for the student-teacher between the lives of youth and the aims of education in our democratic society. Teachers need to understand the learners, to understand our culture with its many defects as well as assets, and, most of all, to understand themselves as personalities engaged in guiding youth. On both the pre-service and in-service levels there are wide fields that educational psychology should cultivate more thoroughly. In addition to specific courses in educational psychology, this psychological aspect should penetrate all courses in teacher education and all curriculum construction in school systems. As educational psychology fulfills its obligation as one of the chief foundations of professional education, the purposes of public education will be, not only clarified, but redirected in terms of well-rounded human development.

As educational psychologists, we should turn toward the philosophers for suggestions on values, which we can examine critically and try experimentally to develop and test in the human organism. We need also to look into the schools to see what is happening there that may clarify the objectives of our own work. Are we facing with our students those problems that lie closest to human values? As we attempt to lead others into a psychological approach toward objectives, we must be clear about our aims and evaluate our own procedures. Indeed, the educational psychologist may need to analyze his own preconceptions concerning values, so they become as explicit as possible to the end that he may be aware of the factors underlying his own choices of problems and his emphases rather than assume a scientific basis, where it may not exist. Certainly, the educational psychologist should select his subject-matter for instruction, his methods of teaching, and his problems for research with an eye upon the objectives of public education in a democracy.

6) HOW LEARNING THEORY IS RELATED TO CURRICULUM ORGANIZATION

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No one will dispute the statement that one of the fundamental bases of curriculum construction should be a knowledge of how individuals learn. But many confusions and cleavages exist among educators with respect to the nature of the learning process and how it specifically affects school curriculums. J. Paul Leonard in his recent book on the secondary-school curriculum apparently feels that psychology is partially responsible for the situation. He says: "Without doubt much of the great confusion in education today is due to the even greater confusion in psychology. We need a more acceptable and convincing explanation of human learning and behavior."[1]

It is easy to understand such a feeling on the part of a curriculum builder. Psychology has never presented in any one place a complete, unified, coherent, and universally agreed upon account of the nature of learning. The science of psychology has not yet reached the stage of maturity which would make such a pronouncement possible. Despite this fact, much is known about learning, and a number of valid principles of great importance to curriculum builders have been established as the result of the efforts of psychological workers.

The purpose of the present paper is to set forth some of the concepts and findings from the field of learning theory which seem to have direct implications for curriculum development. This material will be presented under the following headings: (1) readiness for learning, (2) motivation and learning, (3) organization in learning, and (4) transfer of training.

READINESS FOR LEARNING

Numerous studies[2] have shown that a sufficient stage of physical maturation is necessary before effective learning is possible. Equally important for learning is an adequate mental and educa-

[1] J. Paul Leonard, *Developing the Secondary-school Curriculum*, New York: Rinehart and Co., 1946, p. 84.

[2] Hilgard, Josephine R. "Learning and Maturation in Preschool Chil-

tional readiness.[1] First-grade teachers are usually aware of the concept of 'reading readiness' and understand that until a child has reached a mental age of approximately six years, and has developed in certain other important ways he cannot profit from typical types of first-grade reading instruction. But teachers in the upper grades and high school, and curriculum builders in general all too often fail to recognize that readiness for learning is a prerequisite at all levels. A seventh-grade child who reads at the third-grade level is not ready to tackle seventh-grade reading materials. The child who has not as yet mastered the essentials of arithmetic is not ready for algebra. In building a defensible curriculum it is of utmost importance that for each grade or age group activities and materials be provided which will fit a great range of maturity levels. Courses of study which provide a given text for a given grade or a given set of exercises which all students must do, violate the principle of readiness for learning which is here being discussed.

Investigators who have tried to find the right grade placement for such topics as long division or improper fractions have really missed the point so far as maturation and learning are concerned. Regardless of the grade at which such a topic is placed in the elementary school, there will be some children who are so immature in terms of experience backgrounds that the process will be too difficult for them and perhaps others so advanced in their educational development that the topic will be of no interest or concern to them.

Any type of curricular arrangement which it to be successful must provide experiences which begin where the child is. Any other plan not only eventuates in ineffective learning but inevitably produces frustration which may lead to behavior disorders.[2]

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Shirley, M. M. *The First Two Years: A Study of Twenty-Five Babies*, Vol. 1: *Postural and Locomotor Development*, University of Minnesota Press, 1931.

[1] Washburne, Carleton, in *Child Development and the Curriculum*, Thirty-Eighth Yearbook of the National Society for the Study of Education, Part I, 1939, pp. 299–324.

Kai Jensen, *Ibid*, pp. 325–360.

[2] See E. K. Wickman, *Childrens' Behavior and Teachers' Attitudes*, New York: The Commonwealth Fund, 1928, p. 151.

MOTIVATION AND LEARNING

Both Dashiell[1] and McConnell[2] have clearly shown that all major schools of psychology hold that the organism must be motivated to learn. Motivation has sometimes been termed the *sine qua non* of learning. Certain superficial types of learning have been produced when the organism is not fully ready from a maturational standpoint, but without some form of motivation there will be no response on the part of the organism and hence no learning whatsoever.

Careful investigations by Mowrer,[3] Hull,[4] and others have suggested that all learning is contingent upon need reduction. The organism must have some need, drive, or goal set or there will be no learning. Every individual possesses a few basic drives or wishes that are constantly demanding satisfaction. Besides the physical needs, there are the personality or social needs. Thomas[5] has suggested that there are four fundamental drives of this latter type—the desire for recognition, security, response, and new experience. In addition to these more or less universal needs or drives, every individual develops his own personal needs and interests. These are undoubtedly based upon and related to the more elementary tissue needs of the body, but are so different from them that the connection is difficult to trace. Allport[6] in his discussion of the functional autonomy of motives has clearly shown that an endless variety of human wants can be developed.

The needs, wants, interests, and motives of children should be identified, and learning activities which take these into account

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[1] J. F. Dashiell, "A Survey and Synthesis of Learning Theories," *Psychological Bulletin*, Vol. 32, 1935, pp. 261–275.

[2] T. R. McConnell, "Reconciliation of Learning Theories," in *The Psychology of Learning*, Forty-First Yearbook of the National Society for the Study of Education, Part II, 1942, pp. 262–266.

[3] O. H. Mowrer, "Motivation and Learning in Relation to the National Emergency," *Psychological Bulletin*, Vol. 38, 1941, pp. 421–431.

———, "The Law of Effect and Ego Psychology," *Psychological Review*, Vol. 53, 1946, pp. 321–334.

[4] C. L. Hull, *Principles of Behavior*, New York: D. Appleton-Century Co., 1943.

[5] W. I. Thomas, *The Unadjusted Girl*, Boston: Little, Brown and Co., 1923.

[6] G. W. Allport, *Personality: A Psychological Interpretation*, New York: Henry Holt and Co., 1937, pp. 190–212.

should be provided by the school. The effective curriculum is one which is flexible enough to provide experiences which relate to the individual goals of children. Such an arrangement makes for effective learning and, at the same time, makes possible the development of new interests. The individual who attempts an activity because he believes it will help him reach one of his goals, not only learns the activity but in addition develops a liking for the activity.

ORGANIZATION IN LEARNING AND THE CURRICULUM

A tremendous body of experimental evidence can be marshalled to support the hypothesis that learning proceeds much more rapidly and is retained much longer when that which is learned possesses meaning, organization, and structure.[1] Too often pupils in our schools are asked to learn isolated sets of facts and information which are either unrelated to significant problems facing the learner or appears to him to be unrelated. Under these conditions it is not surprising that forgetting takes place on a vast scale. In a study by Brooks and Bassett,[2] pupils in American history forgot within sixteen months' time approximately one-third of the facts they knew at the close of the semester. In a similar study conducted by Layton[3] it was found that pupils in elementary algebra classes forgot within a period of one year, two-thirds of the material they had known at the end of the course.

No such deterioration or drop in retention seems to occur, however, in those cases where the learner engages in activities which are organized in terms of his purposes and where his objective is to solve problems rather than to learn facts. Word

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[1] E. L. Thorndike, *Human Learning*, New York: Century Company, 1931. J. P. Guilford, "The Rôle of Form in Learning," *Journal of Experimental Psychology*, Vol. 10, 1927, pp. 415–423. G. Katona, *Organizing and Memorizing*, New York: Columbia University Press, 1940. E. B. Newman, "Forgetting of Meaningful Material During Sleep and Waking," *American Journal of Psychology*, Vol. 52, 1939, pp. 65–71.

[2] Fowler D. Brooks and S. J. Bassett, "The Retention of American History in the Junior High School," *Journal of Educational Research*, Vol. 18, October, 1928, p. 209.

[3] E. T. Layton, "The Persistance of Learning in Elementary Algebra," *Journal of Educational Psychology*, Vol. 23, January 1932, p. 52.

and Davis[1] conclude from their significant study that "ability to apply principles, to explain phenomena, problem-solving procedures, and attitudes are retained over a long period with only slight loss."

In view of what we know about organization in learning and retention, it would appear that curriculum builders should design courses of study which make it possible for children to work on problems, projects, and units which possess a high degree of internal organization. Much has been written recently about the core curriculum. One of its greatest strengths is probably the fact that it cuts across subject-matter boundaries and draws upon materials from all fields for the solution of problems. In the selection of problems for the core curriculum, however, the greatest care must be taken to insure that a sufficient variety of problems are included to meet the differing maturity levels and interest patterns of individual children.

TRANSFER OF TRAINING AND THE CURRICULUM

If the pupil possesses the necessary maturation and experience backgrounds for learning, is motivated, and if the material is properly organized, he will learn something. That something might be Latin, Sanscrit, or tiger-catching. According to the theory of formal discipline, anyone of these subjects might possibly sharpen the individual's mind and hence qualify for inclusion in the curriculum.

Scientific studies of transfer of training,[2] however, have repudiated the idea that the mind is composed of faculties which can be sharpened by almost any kind of abrasive material and hence made highly effective in dealing with all types of life's problems.

Thorndike's[3] theory of identical elements would seem to make

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[1] A. H. Word and Robert A. Davis, "Individual Differences in Retention of General Science Subject-matter in the Case of Three Measurable Teaching Objectives," *Journal of Experimental Education*, Vol. 7, September, 1938, p. 30.

[2] William James, *Principles of Psychology*, Vol. 1, New York: Henry Holt and Co., 1890, pp. 666–668. E. L. Thorndike, "Mental Discipline in High-school Studies," *Journal of Educational Psychology*, Vol. 15, 1924, pp. 1–22, 83–98.

[3] E. L. Thorndike, *Educational Psychology*, Vol. II, *The Psychology of Learning*, New York: Teachers College, Columbia University, 1913, pp. 358–359.

it clear that the school curriculum should contain activities and problems which are very similar to those which the individual will encounter in life. Judd's[1] theory of transfer by generalization would likewise seem to support this same conclusion. What pupils learn to do in school is what they will be able to transfer to out-of-school situations.[2] The pupil who learns in the Latin class to say *hic, haec, hoc, huius, huius, huius* should be able to say this after his school days are over provided he has not forgotten it and has any occasion to do so. The pupil who learns to adjust a car carburetor in the school shop should be able to adjust the same or similar type of carburetor after he graduates. The pupil who develops a clear understanding of some principle in school should be able to apply this principle in life if a situation is ever found where the principle applies.

All that we known about transfer of training seems to indicate that those who would establish curriculums should have clearly in mind what it is they want children to learn. Only those materials, activities and problems should be selected which are directly related to these objectives.

SUMMARY

Principles from the field of learning theory which have a significant relationship to curriculum construction have been reviewed. It has been emphasized that the effective curriculum is one which: (1) makes provision for varying maturity and experience levels of pupils, (2) gears learning activities to the needs and goals of pupils, (3) provides projects, problems and units of experience which possess meaning and structure for the pupil, and (4) carefully selects and appraises projected pupil activities in terms of their transfer value to life's situations. The question might be raised as to whether a curriculum can do all four of these things at once. I believe the answer is—yes. The highly enriched and flexible curriculum will provide an almost limitless array of possible activities and learning experiences within certain broad areas. It should then be possible to select for a given pupil only those activities which satisfy these four criteria.

[1] C. H. Judd, *Educational Psychology*, Boston: Houghton Mifflin Co., 1939, p. 514.

[2] See E. R. Guthrie, "Conditioning: A Theory of Learning in Terms of Stimulus, Response, and Association," Forty-first Yearbook of the National Society for the Study of Education, Part II, *The Psychology of Learning*, 1942, pp. 24–26.

7) HOW THE CURRICULUM IS EVALUATED AND MODIFIED THROUGH EDUCATIONAL MEASUREMENT

FRANK S. FREEMAN

Cornell University

Current tests of educational achievement are designed to measure skill, or information, or understanding in a specified school subject, or group of subjects.

Everyone here knows that most tests of educational achievement are devoted to measuring the amount of information recalled, or skills and techniques acquired (as in reading and arithmetic). These devices are educationally useful, but to a very limited degree. And I believe they are very inadequate for the evaluation of the most significant educational objectives.

Tests placing emphasis upon problem-solving, drawing inferences from subject-matter (that is, inductive thinking), application and generalizations to specific stituations (deductive thinking), and attitudes and appreciations developed through the study of course materials—these types of tests are very few in number, although they have been receiving increased attention. As educational tests they are superior to those mentioned a moment ago. Yet they too have serious deficiencies as pedagogical devices.

We are all familiar with the types of items included in most achievement tests; namely, simple recall, two-alternatives (such as true-false), multiple-choice, completion, matching, analogies, and check lists. Pupils and students taking these tests, excepting the completion items, have only to distinguish the correct from the incorrect, and then make a mark. Such activity makes few demands upon psychological processes other than 'recognition.' Experiments on memory have shown that tests of recognition are the easiest type; they yield the highest scores; they demand less cerebration than tests of anticipation, recall, and organization. Completion tests are somewhat superior, in terms of mental activity; for they, at least, require that the student supply the answer himself, even though within a rather rigid framework.

A few tests—relatively few—are intended to measure performance and educational results on a higher, more complex level: these are the tests of evaluation, interpretation, critical thinking. One of these instruments[1] is designed to measure competence in the following: (1) obtaining facts, (2) drawing conclusions, (3) applying general facts. But here again, all necessary information is provided; the possible conclusions, inferences, and the like are all presented. It is the students' task, again, only to evaluate and select what is given.

Other tests in this category are more involved, extensive, and ambitious.[2] But essentially they suffer from the same deficiency as the one mentioned above.

In general, I believe that standardized tests have been used to excess; and, if that is the case, they have had an unhealthy influence upon curriculum content, methods of teaching, and objectives of instruction. We talk and write a great deal about the aims of education in a democracy; but if we may judge from the very widespread use of standardized achievement tests, educational practices hardly coincide with the stated objectives.

Many of the tests—some circulated by reputable publishers—are poor devices even from the standpoint of accepted technical standardization procedures alone; not to speak of their consonance, or lack of consonance, with stated educational aims. But even most of the well standardized tests are of very limited educational significance, because they fail to evaluate what should be the most vital aims of education. The mere acquisition of facts which are soon forgotten—I need hardly say—is not the main purpose of an education. Modern aims emphasize such objectives as the development of concepts and attitudes, critical thinking, analysis and synthesis of materials, creativity, originality, and problem-solving.

Unfortunately, however, standardized objective tests are, by their very nature, seriously limited in the extent to which they can test the attainment of these and similar aims. They are limited because they are standardized and rigid; and because they do not require the learner's own original, spontaneous and creative effort. Critical thinking and other complex mental processes are reduced to a minimum. The best of the tests examine ability

[1] Wrightstone, *Test of Critical Thinking in the Social Studies.*

[2] P.E.A. *Eight Year Study.*

to discriminate arguments and to evaluate assumptions. While they are distinctly superior to the simple measurement of information, their limitations must be recognized.

It appears to me that our problem should not be: "How the curriculum is evaluated and modified through educational measurement:" for that suggests the tests are primary objectives rather than mere tools. I should rather state the problem in this way: How tests should be evaluated and modified on the basis of educational aims.

This Committee is concerned with one aspect of the professional education of teachers; namely, in the fields of child development and educational psychology. For preparation of teachers in the subject of educational measurement, the implications, I believe, are these:

Educators must know the assumptions upon which tests are constructed.

They must understand the process of standardization; especially norms, reliability, and validity; and more especially the fact that achievement test validity is largely a matter of 'face validity' and subjective judgment.

They must have a clear conception of what the tests actually measure; and, fully as important, a conception of their limitations.

They must evaluate tests in terms of their adequacy and their relationships to educational objectives and values.

More emphasis should be placed upon the current types of tests examining the more complex processes. But new tests should be developed such as case-study types, situational tests, or products to be evaluated by the learner.

More emphasis should be placed upon methods of constructing valid essay examinations.

I am sure none of the views I have stated will be news to anyone here. But I have emphasized them because if we are to judge from the number and range of standardized tests being used, it seems that the character of available tests may well be determining content and methods of teaching, rather than the reverse. The relationship must be changed if education is to attain or approximate its stated aims.

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CRITERIA OF LEARNING IN EDUCATIONAL RESEARCH[1]

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TRADITIONAL CRITERIA

The learning criteria most commonly employed in educational research are those of rate and of accuracy of performance in the function taught; for example, number of words spelled correctly, or number of geography questions answered correctly; number of words written, or number of arithmetic examples attempted within a given period of time.

Measures of these kinds obviously have distinct utility, and they must be procured in practically all learning research. Indeed, in some research they are about the only measures of learning we need. This is so when the function learned is of the simplest character, when it amounts to little more than the establishment of arbitrary associations. Thus, we are justifiably satisfied when children can quickly and accurately identify printed symbols as letters, repeat the alphabet, and recite the names of the numbers from one to ten. Such simple learning is not confined to the primary grades, but is found at all educational levels. Samples are: learning the atomic weights of elements in chemistry, mastering words in a foreign language when there are no related English words, and memorizing important names and dates in history. Here, and in similar instances, measures of rate and accuracy usually suffice for the purposes of teacher and pupil alike, and they suffice for the purposes of research in evaluating progress in learning.

THE NEED FOR ADDITIONAL CRITERIA

The situation is, however, quite different for the bulk of school learning. For the most part the school subjects involve much more than the establishment of arbitrary associations. They involve meanings, relationships, and generalizations if the learning outcomes are intellectual; or they involve matters of

[1] Vice-presidential address read before Section Q of the American Association for the Advancement of Science, Chicago, Ill., December 29, 1947.

form if the outcomes are motor skills; or they involve emotional organization if the outcomes are interests, attitudes, and appreciations. Progress in learning of these complicated kinds is but imperfectly assessed by data on rate and accuracy of performance. Indeed, at times such data are quite misleading. It is easy, for instance, to infer nonexistent understanding from correct answers glibly uttered in the history class, or good form from typewriting which contains few errors, or sound attitudes from responses which are no more than parroted verbalizations.

For research relating to these more complex learning tasks we need additional criteria, to supplement and at times even to supplant those of rate and accuracy in the function taught. I shall be able to consider only three such criteria: (1) changes in level of process in learning; that is, changes in the organization of behavior during the course of learning; (2) the retention of learned activities; and (3) the transferability of learned activities. I shall take up these criteria in order.

(1) THE CRITERION OF CHANGES IN LEVEL OF PROCESS

In order to understand what is meant by this criterion it is necessary first to distinguish between the products of learning and the process of learning. The distinction is a fundamental one and should, I believe, be much more generally recognized. Let me illustrate the difference between product and process as these terms relate to learning and to learning research.

In his recent visit to this country the distinguished English psychologist, Professor F. C. Bartlett, recounted some of his experiences in connection with his war research. One of the problems which he and his collaborators investigated was that of the effect of fatigue in the case of airplane pilots. Measures of various kinds were obtained from pilots immediately following prolonged periods of flying under combat conditions. These measures had to do with possible changes in their ability to manipulate airplane controls. So long as the measures were limited to rate and accuracy of manipulation no detectable effects of fatigue were to be found. But when attention was turned to the ways in which the pilots worked the controls (or to the 'processes' which they used), pronounced effects were evident. The quick, easy, assured, rhythmical movements which characterized their behavior when the pilots were fresh

were gone. In their place jerky, relatively uncoördinated, and less well-timed movements were noted. While the deterioration in skill did not at the time lower the rate and accuracy of the adjustments finally made, it was found to be of large prognostic value. As a consequence of their findings with respect to 'process,' Professor Bartlett and his fellow-workers made important recommendations which were immediately adopted by the British Air Service Command.

Let me give a second illustration of the distinction between product and process in learning. This second illustration may not be needed to make the distinction clear, but it will serve to demonstrate the usefulness of the distinction in the organization of experimentation and in the interpretation of experimental results.

I refer to the early research on the place of phonetic analysis in the initial stages of learning to read. In the typical experiment of the older type one group of children were subjected, commonly for a short period of time, to training in phonetic analysis. Meanwhile another group of comparable children were taught to read without special attention to phonetic analysis. Usually at the end of the experiment no measurable differences were found in rate and accuracy of reading. On the basis of these measures, which are 'product' measures, the conclusion was drawn that phonetic analysis performs no real function in primary grade reading.

In one experiment,[2] however, these measures of rate and accuracy were supplemented by interview data relating to processes used by the children in dealing with new words. It was found that some of the children who had had no special training nevertheless employed various types of phonetic analysis. Spurred on apparently by their self-recognized needs, these children had worked out their own phonetic procedures much like those used by their rival subjects. The implications of these findings on process cannot be disregarded in any thoroughgoing evaluation of the worth of phonetic analysis in reading in Grades I and II.

As I have already suggested, we get nowhere, unless possibly

[2] W. H. Winch. *Teaching Beginners to Read in England: Its Methods, Results, and Psychological Bases.* Journal of Educational Research Monographs, No. 8. Bloomington, Ill.: Public School Publishing Co., 1925. p. 46, *et seq.*

into error, when we try to make measures of rate and accuracy serve purposes which they cannot serve. They are 'product' measures. They reveal status attained in learning, but they reveal little or nothing with respect to progress in the re-organization of learning responses. The quickest responses are sometimes furnished by children who perform at the lower levels of process. Many a child who is a rapid counter will secure the answer for 8 + 4 by his process more quickly than will the child who is just beginning to use a more mature process, such as 8 + 4 is the same as 8 + 2, + 2. Yet the latter child is materially in advance of the first in maturity of process. He is further along toward meaningful habituation of the combination.

The instance just cited illustrates the fact that measures of rate and accuracy may vary independently from measures of process level. Rate and accuracy evaluate efficiency of performance, but the performance itself may take place at any level of process, from clumsy to neat, from amateurish to expert, from concrete to abstract. Hence, the significance of rate and accuracy measures is not absolute, but relative. Yet, commonly in educational research rate and accuracy data alone are secured and are then made the basis for proposals for educational practice that may or may not be sound.

The criterion of process used, or of level of performance, is proposed for general acceptance in educational research on two grounds. The first is that research will then yield more complete accounts of learning and will prevent distortions therein. The second is that research will then provide teachers the information they need for the better direction of learning.

When the swimming coach would help his students to improve their skill, he finds only a little that is useful in measures of rate and accuracy of performance. Instead, he observes what his students do, and he offers suggestions for the re-organization of their patterns of behavior. In a word, he works directly with the process of swimming. Moreover, the research on swimming which he values most highly is that which reports better types of form and teaching methods to produce them. In this research, measures of rate and accuracy of course have their use; but that use is to afford evidence regarding the greater efficiency of the new swimming forms and of the effectiveness of the teaching methods recommended to develop them.

The same sort of statement may be made for ideational learning

as it proceeds in school. We want children to acquire, not an empty, meaningless definition of 'democracy,' but a rich, functional concept for the word, a concept which leads them habitually to behave in a democratic manner. Were we satisfied with a memorized definition, teaching would consist merely in the administration of repetitive practice on the definition; and measures of rate and accuracy would serve as adequate criteria of learning. But we are not satisfied with a memorized definition of 'democracy'; hence, teaching must be more than the administration of repetitive practice. Instead, the instructional program must set and order a variety of appropriate learning experiences. It must also allow for the continuous observation of the meanings which children successively associate with the term as they approach the kind of concept we want them to have. In arranging and managing these activities and in evaluating progress in learning, the teacher is naturally interested in accuracy; but he is equally interested in changes in performance level. When the teacher asks how to teach such concepts as 'democracy,' he invites research in which the criterion of process level is given prominence.

Attitudes also represent complex organizations of behavior, comprising as they do both ideational and emotional components. The adult's attitudes, good or bad, are the consequences of the progressive re-organization of his behavior. Instruction in the case of attitudes, as in the case of motor skills and of ideational learning in general, is successful to the degree that the teacher recognizes and interprets behavior that is significant for their development. He must know both the behavioral changes which are to be encouraged and those which are to be discouraged. To improve his technique of teaching he needs all the help he can get from research; but he finds little of this help in research on attitudes which neglects the criterion of process level.

Educational investigators have been slow to include level of process among their criteria, and for several reasons. Perhaps chief among these reasons is the rather generally entertained suspicion that data on process level are likely to be invalid and unreliable. But such data need not be untrustworthy, for there are ways to surmount the difficulties. (a) Subjects' errors in learning may provide acceptable data, as has been demonstrated more than a few times. (b) It is possible in many instances to

devise special objective tests on process level, to supplement the tests commonly employed to measure rate and accuracy. (c) Even subjects' reports of their own processes, of all types of data the most suspect, may with proper precautions yield reliable evidence.[3] It is sheer defeatism to say that we cannot obtain these data. Far better is it to view as a challenge the obstacles we face and to discover means of circumventing them. The need for the data warrants whatever effort is called for.

I have dwelt at length, perhaps over-long, on the first of the three criteria which I intend to discuss. If any defense is required, it is to be found, on the one hand, in the neglect the criterion has been accorded in educational research and, on the other hand, in the great practical gains which would accrue to instruction, were it generally adopted.

(2) THE CRITERION OF RETENTION

There is of course nothing novel in the suggestion that educational research on learning should include data on retention. The criterion is isolated for attention here primarily because it has not enjoyed the place it merits.

The term 'retention' is not exactly appropriate when applied to school learning. When used in its precise meaning, 'retention' refers to the maintenance of skill, knowledge, or attitude without practice of any kind after the period of learning. Retention in this sense occurs seldom in school learning, and then only by the imposition of arbitrary conditions. Ordinarily, what is learned at any time in the classroom is later put to use, intentionally or otherwise, either in its own right or in connection with new learning. Hence, once acquired, a function receives some kind of practice later on; so, it is not 'retained' in the strict psychological sense. Nevertheless, since there is no better word, 'retention' is used here in the statement of the second criterion.

As a criterion for educational research retention gets its importance from the fact just described; namely, that what is taught in the classroom is only rarely taught for temporary purposes. Yet, relatively little educational research reports retention data. In the vast majority of investigations measures pertaining to the function learned are abandoned as soon as the

[3] See, for example: William A. Brownell, "Rate, Accuracy, and Process in Learning." *Journal of Educational Psychology* 35: (1944) pp. 321–337.

experimental subjects have attained the degree of accomplishment prescribed by the investigator.

Perhaps it is assumed by some that whatever is learned to the investigator's standard will inevitably resist the lapse of time and of exercise. This hypothesis seems to underlie much research on remedial teaching, for example. The investigator or his coöperating teachers employ special devices to correct disabilities, thereby bringing their subjects to the average proficiency of their mates, or as nearly so as is possible. These pupils are then supposed to maintain their status.

But how many children do profit to this extent from remedial instruction? In one of the few studies of this problem with which I am familiar,[4] the results were quite different from the expectation. Two years after a group of children had been brought up to their grade level in arithmetical computation, they were back where they had started. Again they lagged behind their fellows and were ready for more remedial teaching. One suspects that the findings of this study would be duplicated many times over if remedial teaching were evaluated, not merely in terms of its immediate consequences, but also in terms of its lasting effects.

In the light of what is known about the psychology of retention, it is absurd to trust in the permanence of school learning, a notion which, it has been suggested, may be one reason for neglecting retention measures in educational research. But there are unquestionably other reasons as well. One of them is related to the limitations under which the investigator has to work. It is often difficult to set up and maintain anything like adequate controls over classroom learning during a long period of experimentation. To extend the period of control in order to obtain evidence of retention may amount to a practical impossibility in some instances.

Whatever the reasons for disregarding retention measures, the results are unfortunate for classroom practice. After the cessation of exercise anything can happen to the function learned. Most commonly there are losses, in many cases of large size. If so, it is important for us to know this and to be able to identify

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[4] Eaton O. Bemis and W. C. Trow, "Remedial Arithmetic After Two Years." *Journal of Educational Research* 35: (1942) pp. 443–452.

the causes, the better to combat the losses.[5] On the other hand, in some few cases the status attained in the function suffers relatively little. When this happens, we again need to know why. In still fewer cases the status attained in learning may actually be advanced after instruction has been stopped.

I should like to cite a study of the last-named type. In this investigation[6] children were taught to add and to subtract simple fractions in Grade II, as much as two or three years before these skills are customarily presented. The teachers were directed to give no instruction in these topics after the conclusion of the experiment proper. Nevertheless, when the end-test was repeated some weeks later, most of the children in certain classes secured higher rather than lower scores. An explanation was found in the day-by-day records kept by their teachers. These pupils had become very much interested in their new skills, and they had continued 'on their own' to explore fractional relationships with the concrete materials which were at hand. While here again the term 'retention' does not exactly describe the period following instruction, two facts should be noted. First, the investigator had expected possible losses of the kind usually reported. That the losses did not occur is in itself an important finding. Second, provision for measurement after a period without deliberate instruction resulted in data of great value. These data, which otherwise would not have been secured, both confirmed the conclusions drawn respecting initial learning and added greatly to their implications.

The criterion of retention, valuable as it is, is open to abuse. It is abused, for example, when adequate consideration is given neither to the conditions of learning (including the nature of the learning task) nor to the procedures employed to measure retention.

A case in point is to be found in many investigations of long-time retention of the subject-matter taught in the school. Gen-

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[5] In this connection it is interesting to speculate about some research which reports large gains for the experimental factor during the period of learning. Substantial losses during the period of retention could easily wipe out these gains and disprove the supposed value of this factor.

[6] Harold E. Moser. *Concept of Arithmetic Readiness; An Investigation on the Second-Grade Level.* Unpublished Ph.D. thesis on file in the University library, Duke University, 1947.

erally, startling losses are disclosed. Analogies are sometimes made with the curves of forgetting exhibited in the classical studies of Ebbinghaus; and we are led to believe that these school losses, large as they are, are inevitable and permanent. Not so many years ago the disappointing data on retention obtained from college students were construed as evidence of the wastefulness of college education.

It is to be remembered that Ebbinghaus had his subjects learn nonsense syllables. When retention curves for school children reveal the losses characteristic of the Ebbinghaus curves, these losses should not be misinterpreted. The inference to be drawn is that these school children, like Ebbinghaus's subjects, learned nonsense material. In other words, the material to which they were exposed possessed little meaning or significance for them; it was memorized with a minimum of understanding. The implication is not that all instruction is futile, but rather that a particular kind of instruction is futile. There is no excuse for teaching school subject-matter as bodies of nonsense statements; but when it is so taught, the results are predictable.

Moreover, in many studies on the problem in question the means used to measure retention are open to criticism. It has long been known that retention scores vary with the technique of measurement. Recall tests make the most severe demands upon memory. Recognition tests also make heavy demands, but demands less drastic than those of recall tests. Tests based upon re-learning are the most sensitive, for they reveal learning residues below the threshold of recall and recognition. Studies of retention in the case of the school subjects customarily make use of recall and recognition tests. Furthermore, these tests are frequently constructed so that intrinsic relationships are concealed as far as is possible. Under these conditions it is difficult for knowledge to manifest itself, and retention scores are correspondingly low. On the other hand, investigators could, occasionally at least, employ the technique of re-learning to measure retention. If they did so, and if they made intrinsic relationships available, their subjects might demonstrate surprisingly high amounts of maintenance.

To conclude, I am arguing that learning studies in education are incomplete when they omit information with respect to retention. Without sound data on retention, we may propose

for the classroom instructional procedures and learning activities which are subversive of economical and lasting achievement. The practical purposes of our research require that we have the full story of what happens in connection with the learning problems we study.

(3) THE CRITERION OF TRANSFERABILITY

I have already alluded more than once to the third learning criterion, which is transferability. I did so, for example, when I suggested that school learning is customarily cumulative. Characteristically, what the pupil learns today in school, he will need and use tomorrow, if not precisely in the situation of learning (which is of course actually impossible), then in a new situation to which it is relevant. In this last phrase we speak the language of transfer, and we admit that the criterion of transferability is essential in educational research on learning.

Let me illustrate the place of the criterion in research. Two common procedures have been recommended for teaching children to 'borrow' in subtraction. The relative merits of these procedures have been investigated fifteen times, but only as the procedures are used in subtraction with whole numbers. The research evidence up to now has pretty generally favored the procedure known as 'equal additions,' though it is not taught in American schools as often as is its rival.

According to the procedure of equal additions, in the example 73 − 49 one adds 10 ones to the 3 of 73 and gets 13 ones, from which he subtracts 9. Then he adds a ten (hence 'equal additions') to the 4 tens of 49, and subtracts 5 from 7. He thinks, "9 from 13, 4; 5 from 7, 2." Most of you probably use the procedure known as 'decomposition.' According to this procedure you think, for 73 − 49, "9 from 13, 4; 4 from 6, 2."

Years ago Knight[7] pointed out that we have to 'borrow' not only with whole numbers but with fractions and with denominate numbers, in such examples as $4\frac{1}{2} - 2\frac{7}{8}$ and 4 yd. 1 ft. − 2 yd. 2 ft. He suggested that the procedure of equal additions does not transfer as readily as does decomposition to these more advanced subtractions. Hence, he proposed that in spite of the substantial research evidence for equal additions we should teach

[7] F. B. Knight, G. M. Ruch, and E. O. Lutes, "How Shall Subtraction Be Taught?" *Journal of Educational Research* 11: (1925) pp. 157–168.

decomposition. Knight was evoking the criterion of transferability, a criterion which had never been used in the study of the question.[8] Here then is a case, admittedly theoretical, where application of the criterion of transferability might well set aside the findings of numerous studies in which the criterion has not been applied.

But we need not be only theoretical. In connection with this same problem; namely, the comparative values of equal additions and decomposition in subtraction, we now for the first time have transfer data; and these data throw new light on the controversy. In previous research, as I have stated, the issue has been resolved in favor of equal additions, for it produces considerably quicker computation and a somewhat higher degree of accuracy in dealing with whole numbers. But these measures were regularly secured from tests covering precisely the type or types of subtraction actually taught, these and nothing more. That is to say, no attempt was made to discover how the subtraction procedures compare from the standpoint of the transferability of the skills taught.

In the most recent study[9] of the problem the conclusions of earlier research have been confirmed as far as they go. When both procedures were taught with a minimum of understanding, as seems to have been true in previous studies, equal additions surpassed decomposition in rate and accuracy in the type of subtraction taught. When both procedures were taught with a maximum of understanding, however, decomposition was superior to equal additions by a small but dependable margin in the type of subtraction taught, but by a very wide margin in more complex but untaught types of subtraction. These latter data, particularly those relating to transfer, reverse the order of merit as between the two procedures and make decomposition rather than equal additions the procedure to teach third-grade children. In a word, application of the criterion of transferability enabled

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[8] Over a period of years I have informally checked Knight's shrewd insight. Never in my graduate classes of teachers have I found more than five per cent of the users of equal additions who used this procedure consistently with whole numbers, fractions, and denominate numbers.

[9] William A. Brownell and Harold E. Moser. *Meaningful vs Mechanical Learning: A Study in Grade III Arithmetic*, to appear in 1948 as No. 8 in the series, Duke University Research Studies in Education.

decomposition to reveal advantages that were hidden by research in which the criterion was omitted.

With the current renewed educational emphasis upon understanding as a learning outcome, the criterion of transferability takes on special weight. As is well known, ability staisfactorily to perform a learning task immediately following the period of instruction is no guarantee of functional learning. This is especially true when the evaluation situation resembles closely the learning situation. Successful performance may signify nothing more than mechanical mastery. The same possible error of interpretation resides in retention measures when those measures are secured in situations closely similar to that of learning. After all, one can retain, for some time at least and without practice, skills and verbalizations that have been acquired without understanding. On the other hand, ability to use the learned idea or skill in situations differing from the learning situation is evidence of understanding; and the greater the differences in situations and the longer the transfer measures are deferred, the better the evidence is.

Since transfer is of vital concern in education, transferability is a vital criterion in educational research on learning—this, in spite of the fact that probably not ten per cent of educational investigations give recognition to the criterion. Reasons for this neglect are perhaps numerous and varied; but whatever the reasons, the effect is not good, for we fail to study learning in one of its most vital aspects. It is to be hoped that these reasons will disappear and that we shall then undertake seriously and more consistently to fill in the gaps in our data now created by disregard for the criterion. One great area for future research might well be the re-working of some of the more crucial investigations of the past to see whether they stand up under the further criterion of transferability.

IN CONCLUSION

Have I set high standards for educational research on learning? That is precisely what I intended to do. It is time that we raise the level of our research. We have had too many fragmentary, superficial investigations which purport to show that this or that needs to be done to modify classroom teaching. Some of our research is, of course, highly commendable, particularly in what

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may be called its technical structure. The populations used are of requisite size; fairly good controls have been established, and the statistical treatment is appropriate. Yet, many of these studies have offered little by way of trustworthy guidance for the improvement of classroom teaching. One of the main reasons, I feel confident, lies in the criteria adopted for evaluating learning. Too often we have been content at the close of periods of learning to measure rate and accuracy of performance in the function taught. We have not felt it necessary to go beyond these criteria and to secure additional measures of process level at successive stages in mastering the new skill or idea or attitude. Nor have we concerned ourselves enough about the retention of what is learned or about its transferability in useful ways to new learning tasks.

Have I set standards that are impossible of attainment? Perhaps so. An investigation which satisfies all criteria essential to the complete evaluation of learning is not likely to appear in my lifetime. I am counselling no gospel of perfection. Rather, I am suggesting that we can do better research than we now do. We already know how. Certainly the criteria of learning which I have discussed are not new. And with equal certainty they find place in research much less often than should be the case. We can raise the quality of our research and make our findings of far greater value for classroom teachers merely by doing what we know we should do; namely, by broadening the base of our evaluation to include aspects of learning which we now disregard.

IMPROVING THE SCHOLARSHIP OF COLLEGE FRESHMEN WITH REMEDIAL READING INSTRUCTIONS

MARY McGANN

Worcester, Mass.

A conference on results of testing at the beginning of the new term made the college freshmen recognize the need for improving their reading and study skills. Although their programs were already crowded, they volunteered to devote a double period weekly for the purpose of obtaining remedial reading instruction. Since no credit was offered for this course, any study in connection with it was voluntary. In spite of these adverse conditions, the work was undertaken with enthusiasm and the course proved to be a valuable aid to better scholarship. A detailed explanation of the remedial program may be of assistance to instructors faced with similar problems.

The Iowa Silent Reading Test, Revised Form A, was administered to the entire class at the beginning of the fall term. In addition, the Tyler-Kimber Study Skills test was used to secure information regarding study habits. After tabulating results on these tests, individual conferences with the students and remedial reading teacher were provided to inform the students of their particular weaknesses on both tests, and their quartile rank. Lessons were prepared to treat these weaknesses under group instruction.

The two-hour period was evenly divided for reading and study skills. Vocabulary words, listed on the board, were copied before or after class for study. The lesson was introduced with an explanation of the meanings of new words listed, so that the more difficult ones could be recorded on vocabulary cards used for further study. Small index cards permitted two new words to be written on one side and the meaning and examples of usage on the other.

A written vocabulary review followed. The students rapidly wrote the meanings of twenty words dictated by the teacher. Papers were corrected immediately so that a record of progress could be kept as well as an index of words requiring further study, for the more difficult words were repeated on reviews until

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mastered. Games with vocabulary cards instead of usual card games were suggested, and honorable mention was given to those who collected the most cards and obtained highest scores.

Other vocabulary study included lists of prefixes, suffixes, root words, foreign word origins, synonyms, antonyms, homonyms, and pictorial explanations posted on the bulletin board. The English teacher coöperated by requiring four new words from any studies to be submitted daily with explanation of meaning and use.

The second half of the reading period was devoted to study and analysis of what constitutes good reading. The materials used permitted the students to learn about reading at the same time as they improved speed and comprehension. Also, many practice exercises were used to develop the various reading skills.

The materials for reading exercises were provided by Ruth Strang's *Study Type Reading Exercises* and William McCall's and Louella Crabbs' *Standard Test Lessons in Reading*, both published by the Bureau of Publications, Teachers College, Columbia University, New York. The booklets were used according to instructions in the manuals.

Among numerous other sources for vocabulary study were dictionary tests published by G. and C. Merriam Co., Springfield, Mass.; *How to Enlarge and Improve Your Vocabulary* by R. Mallery, Blakiston Co., Philadelphia; *Words at Work* by J. Bellafiore, Amsco School Publications, 225 West 57th St., New York; *The Markhart Vocabulary Builder*, published by Mark Hart, Preston, Idaho; and *Teachers Word Book* by E. Thorndike and I. Lorge, Teachers College, Columbia University, New York.

Much pleasure reading of magazines, newspapers, and library books was encouraged. The English and social studies teachers required frequent book reports to give opportunity for prolonged supplementary reading.

The second hour of the remedial period was devoted entirely to study skills. With the aid of the remedial instructor, the class was permitted to prepare the assignment for any lesson which proved difficult. Usually the physiology or the social studies lessons furnished the basis of instruction on how to study. Thus it was possible to learn the ideal situation by working on actual assignments.

Much practice was required for outlining and notetaking.

Opportunity was provided for making notes on suggestions for good physical conditions of study, use of time, studying for and taking examinations, memorizing, and concentration.

RESULTS AND CONCLUSIONS

Unfortunately Form B of the Iowa Silent Reading Test could not be used for retesting, for the answer-key was not available because the latest revision of the test had not been used, and the older tests had been out of print. Nevertheless, a retest was given with the Nelson-Denny Reading Test which gave percentile norms in freshman reading which, although not comparable, still served the purpose of affording the students evidence of their progress since the instruction began. This test was administered a week before the Christmas vacation, and revealed considerable gain, as shown in Table 1.

TABLE 1.—TEST RESULTS ON FRESHMAN READING
(Percentile Norms)

Remedial Student	Iowa Reading Test Sept. 16, 1946	Nelson Denny Dec. 12, 1946	Percentile Points Gained
A	79	96	17
B	77	79	2
C	75	86	11
D	70	79	9
E	65	95	30
F	54	77	23
G	43	23	−20*
H	36	95	58
I	30	79	49
J	27	52	25
K	25	74	46
L	23	52	29
M	15	29	14
N	6	49	43

* This loss is explained by the fact that two aching molars and sorrow over death in the family interfered with normal performance.

The tabulation does not include several students with incomplete records. It shows definite trend toward rapid improve-

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ment in reading can result even from weekly lessons given during a period of three months. The class work, also, showed great improvement because the students were gaining confidence with added skill. Remedial reading, when provided at the beginning of the freshman year, can help to eliminate failure which results from lack of good reading and study habits, and aid in the development of better scholarship during the years to come. If a similar program were provided at the senior high school level, students would be better prepared to do college work with success.

BOOK REVIEWS

DARREL J. MASE. *Etiology of Articulatory Speech Defects.* A Comparison of the Incidence of Six Selected Factors in Children Having Articulatory Speech Defects with the Incidence of the Same Factors in Children Not Having Speech Defects. New York: Bureau of Publications, Teachers College, Columbia University, 1946, pp. 85.

How do children with articulatory speech defects differ from children without such defects? This is the major problem the author set out to study. A review of the literature revealed to him the paucity of significant research in the etiology of articulatory speech defects as well as conflict in conclusions. From this literature, he picked six factors often listed as causative in development of articulatory speech defects. The six factors investigated by him include: hearing acuity, memory span, diadochokinetic movements of articulators, general muscular coördination, tonal memory and rhythm, and auditory articulatory discrimination. Fifty-three fifth- and sixth-grade children from the public school of Trenton, New Jersey, were the subjects. Paired with every experimental subject was a boy of normal hearing matched on the basis of chronological age, socio-economic background, grade placement, intelligence rating, and academic achievement. Procedures were carefully investigated before applied and carefully interpreted.

The general conclusions were negative. That is to say, no significant differences were found between children with functional articulatory speech defects and their matched controls on any of the factors tested. The only tests that have some possibilities of revealing significant differences are tests of auditory acuity and lip mobility. In working up the materials and in interpretation of results, the author shows a fair measure of persistence as well as resourcefulness and carefulness. The Rail-Walking Test he describes as a valuable tool in speech clinic and testing for general muscular coördination. He also, in the light of his findings, recommends further research that might be needed in the field.

This is a dissertation study by Dr. Mase that can be of value to all students of speech, particularly research workers and therapists who deal with articulatory speech defects.

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JOHN GRAY PEATMAN. *Descriptive and Sampling Statistics.* New York: Harper and Brothers, 1947, pp. 577.

This volume covers the two aspects of statistics indicated by its title in a quite thorough manner. It will undoubtedly take position among the few best books for use in the field of educational and psychological statistical methods. The first part, on descriptive statistics, consists of an introduction, several chapters dealing with categorical data, and several dealing with variables. Measures of central tendency and other point measures, deviations, correlation, elementary graphing, the normal curve, and other related topics are included. The second section deals with sampling techniques, probability and statistical inference, hypotheses and tests of significance, the significance of differences, Chi-square, the predictive meaning of coefficients of correlation, the application of correlation methods to psychological tests, and briefly with cluster and factor analysis. Finally, there is a short, well-selected bibliography, which, however, might well have included more texts in the field of educational and psychological statistics, lists of symbols and terms, and tables of statistical functions and of squares, square roots, and reciprocals.

Most of the discussions are clear, easily comprehensible, and quite complete; especially the treatment of sampling is one of the best with which the reviewer is acquainted. There appear to be few typographical and computational errors. The figures are well done and the general appearance of the volume is good.

Several omissions were noted. There is no list of tables or figures. Not all of the commoner and most useful types of graphic presentation are included, nor is the smooth curve, either ordinary or cumulative form. The short method of computing the mean for ungrouped data does not appear, nor does the *R* method of rank correlation. In many instances frequently employed synonyms of the author's terms are not given. Other than these the volume includes practically everything that, in the reviewer's judgment, should appear in a year-course in this field. Yule's coefficient of association, and triserial, quadriserial, and quintiserial correlation, are topics treated which are not commonly found in such texts. It is rather doubtful if the typical worker in the field will have use for these procedures.

There are quite a number of specific points, mostly minor, to

which the reviewer would take exception. In the computation of the mean deviation, unfortunately called the average deviation, there is erroneous treatment of the class containing the mean. The statement is made that a reported point score regularly means from half a unit below to half a unit above that point, and that, for example, an intelligence score of 100 means 99.5 up to 100.5. This latter statement, particularly, can not be justified. For practically all short-answer tests, whether of intelligence, subject-matter or something else, a score of a given number of points means at least that many points but not the next large number. In graphing the frequency polygon the author leaves the ends 'up in the air.' The critical ratio is defined as being a T value of 3.0 or more, whereas, of course, it may have any value. Moreover, the only formula given for the critical ratio is that involving the standard error; that originally suggested by McGaughy, however, involved the probable, not the standard, error. The statement is made that there are 101 centile values, whereas it is better to state that there are only 99. Throughout the book the word 'percentage' is used where 'per cent' would be preferable. The formula for the coefficient of contingency is not in its simplest form, and the method of computation given is more laborious than necessary. The placement of titles of figures is not that generally accepted.

There are a number of unusual and, in one or two cases, probably original, uses of symbols and terms. Among these are the following: 'tercile' instead of 'tertile'; the use of a small letter as well as a large for the variable itself, rather than just for its deviation; 'S' rather than 'z' for a standard score; 'M_u' rather than '$\tilde{M}$' for mean of a universe; 'L' rather than 'n' in the Spearman-Brown formula; 'C_c' rather than 'C_x' for any centile, 'σ_x' for the standard error of a score rather than the standard deviation of variable 'X.' Others, not so unusual but which seem undesirable, are: 'Mdn' rather than 'Md' for median; '$Q.D.$' rather than 'Q' for quartile deviation; '$G.M.$' for guessed mean rather than for geometric mean.

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